The University of Western Ontario
Faculty of Science

DEPARTMENT OF APPLIED MATHEMATICS

AM 1411B – LINEAR ALGEBRA FOR ENGINEERING
COURSE OUTLINE 2012-2013

Description
This course first introduces the methods for solving linear equations. Engineering examples are used to motivate the subject. Vectors and matrices are then introduced. Finally, the analysis of linear systems by eigenvalues and eigenvectors is covered. All topics include engineering examples.

Prerequisites
High school mathematics

Corequisites
None

Antirequisites
None.

Contact Hours
3 lecture hours , 2 tutorial hours, 0.5 FTE course.

Lecture section 001: MWF 9:30 – 10:30, WSC-55.
Tutorial section 002: Tuesday 2:30 – 4:30, SEB-1200.
Tutorial section 003: Thursday 10:30 – 12:30, SEB-1059.

Instructor
Prof. D. Jeffrey (MC 255) Telephone: 519-661-2111 ext: 88776 email: djeffrey@uwo.ca

Teaching Assistant
TBA

Required Text
Either: "Elementary Linear Algebra. Applications Version", by Howard Anton and Chris Rorres,
Or: "Elementary Linear Algebra", by Howard Anton and Chris Rorres.
The latest edition is 10th, but the changes are minor from previous editions. It is not difficult to find the same material in different editions.

Reference Texts
All books called linear algebra contain similar material. Go to the library and browse the shelves around books catalogued at QA 184.

Course Notes
Course notes will be available for download from the course website.

Units
SI units will be in lectures and examinations.

General Learning Objectives

Knowledge Base	X	Individual Work	x	Ethics and Equity	
Problem Analysis	X	Team Work		Economics and Project Management	
Investigation		Communication		Life-Long Learning	X
Design		Professionalism			
Engineering Tools	X	Impact on Society			

General Learning Objectives
The general objectives for student are:
- Understand where linear equations arise in engineering.
- Understand the concept consistent and inconsistent equations.
- Understand the concept of linear transformation.
- Understand the concept of eigenvector.

Specific Learning Objectives

- Engineering Applications**:** electrical networks, pipe and traffic flow, data fitting.

- Systems of Linear Equations**:** solving systems of linear equations by Gaussian elimination

- Matrices**:** matrix operations, inverses, elementary matrices, special types of matrices

- Determinants**:** cofactor expansion, properties, Cramer's rule

- Linear transformations**:** linear mapping between vector spaces, matrix representation of linear transformations

- Orthogonality: inner product, orthonormal bases, Gram-Schmidt process, least-squares approximations, orthonormal matrices

- <u>Eigenvectors:</u> finding eigenvalues and eigenvectors, characteristic polynomial, properties of eigenvalues and eigenvectors, diagonalization, geometric and algebraic multiplicity, similarity, orthogonal diagonalization of real symmetric matrices

Evaluation
The final course mark will be determined as follows:

Tutorial test: week of 21 Jan. (22 and 24)	10 %
Tutorial test: week of 4 Feb. (5 and 7)	10 %
Tutorial test: week of 4 Mar. (5 and 7)	10 %
Tutorial test: week of 18 Mar. (19 and 21)	10 %
Final Examination	60 %
Total	100%

Tests and Examinations
The tutorial tests will be one hour long. Because of the shortage of rooms in the university, the test will be written in two sittings. The tests will be **closed book**. The final examination will be open book and will take place in the regular examination period.

Addendum to all Applied Mathematics Course Outlines

The UWO Senate Academic Handbook has specified that the following points should be added to all course outlines:

1. Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

2. Plagiarism Checking: The University of Western Ontario uses software for plagiarism checking. Students may be required to submit their written work and programs in electronic form for plagiarism checking.

3. Prerequisites for a course: Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

4. If computer-marked multiple-choice tests and/or exams are given: Use may be made of software to check for unusual coincidences in answer patterns that may indicate cheating.

Accreditation (AU) Breakdown
Engineering Science   =   100%

January 4, 2013/djj